PATENT ABSTRACTS OF JAPAN

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(54) MANUFACTURE OF PRODUCT BY COMBINING PLURALITY OF COMPONENTS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method of manufacturing a product by combining a plurality of components, wherein the overall performance of the product can be satisfied, even if one or more defective components are combined together after their defects have been corrected, and wherein the lead time can be shortened.

SOLUTION: When there is a defective product (step S1), average values are set which are obtained based on design values for the required performance of a defective component (step S2), after which the variance of the defective component is set (step S3), and the number of its required data is set (step S4). Then, pseudo-normal distribution performance data is generated based on these values (step S5), and the performance data of the defective component is tentatively registered as that of an unused component (step S6). Next, the performance data of all components, including the component whose characteristics data is tentatively registered, are read (step S9), and the characteristics data of part of the components are selected. Then, patterns for selecting components are generated and combined, and overall performance data is calculated using the performance data of the various components selected through these patterns (step S11), whereby an optimal combination pattern is obtained (step S12).
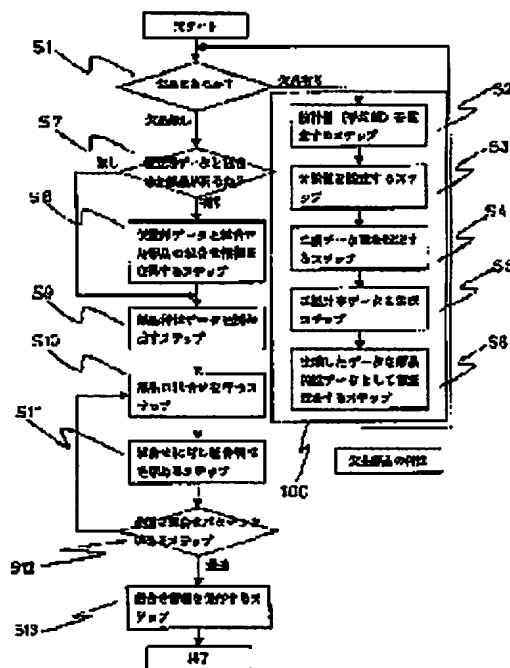
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CLAIMS

[Claim(s)]
[Claim 1]A method of manufacturing combining two or more parts, comprising:
The 1st process of judging existence of missing item parts which cannot obtain among two or more parts taken to assemble and to manufacture a product, and are missing items.
A required data number is set to setting out of a variance from which the above-mentioned missing item parts are expected after setting up average value based on a designed value for the demand characteristics of missing item parts in the 1st process of the above at the time of a judgment with the above-mentioned missing item parts, And the 2nd process that generates false normal distribution value characteristic data based on the above-mentioned average value, a variance, and a data number, and is registered provisionally as missing item component-characteristics data.
The 3rd process of reading characteristic data of all the parts containing data registered [above-mentioned] provisionally after parts data required for manufacture of the above-mentioned product was assembled.
The 4th process of computing overall-characteristic data with which it was satisfied of a standard from characteristic data of each parts which chose one part from characteristic data of parts by which reading appearance was carried out [above-mentioned], and generated and combined each part article type combination pattern, The 5th process of attaching and saving an identifier to parts data of the above-mentioned provisional registration to the time of judgment that the above-mentioned combination pattern is the optimal so that discernment from combination with acquisition parts may be possible after the part acquisition.

[Claim 2]How to manufacture combining two or more parts according to claim 1 registering it provisionally as intact parts data based on a designed value of the demand characteristics of newly judged missing item parts whenever it judges the 2nd process of the above at the 1st process of the above to be those with missing item parts.
[Claim 3]The 2nd process of the above sets up a data number required after performing a statistical work of missing item component-characteristics data in the 1st process of the above at the time of a judgment with the above-mentioned missing item parts and generating statistical work data, And a method of manufacturing combining two or more parts according to claim 1 generating false normal distribution data based on the above-mentioned statistical work data, and registering this distribution data provisionally as missing item component-characteristics data.
[Claim 4]The 2nd process of the above computes the number of data requirements automatically with setting out and the number of existing parts of a variance it is expected that the above-mentioned missing item parts are after setting up average value based on a designed value for the demand characteristics of missing item parts in the 1st process of the above at the time of a judgment with the above-mentioned missing item parts, and is generated, How to manufacture combining two or more parts according to claim 1 registering missing item component-characteristics data provisionally as intact parts data.
[Claim 5]The 2nd process of the above sets a required data number to setting out of a variance from which parts of the above-mentioned missing item are expected after setting up average value based on a designed value for the demand characteristics of missing item parts in the 1st process of the above at the time of a judgment with the above-mentioned missing item parts, And a method of manufacturing combining two or more parts according to claim 1 a random number's generating data

based on the above-mentioned average value, a variance, and a data number, and registering provisionally as missing item component-characteristics data.

[Claim 6]The 2nd process of the above sets a required data number to setting out of a variance from which the above-mentioned missing item parts are expected after setting up average value based on a designed value for the demand characteristics of missing item parts in the 1st process of the above at the time of a judgment with the above-mentioned missing item parts, How to manufacture combining two or more parts according to claim 1 generating data which runs short so that it may become a false normal distribution including the existing data, when a data number of this data number and other parts does not suit, and registering provisionally as missing item component-characteristics data.

[Claim 7]How to manufacture combining two or more parts according to claim 1, wherein the 5th process of the above makes conditions of the optimal judgment of the above-mentioned combination pattern so the optimal that there are many parts to cover.

[Claim 8]How to manufacture combining two or more parts according to claim 1, wherein the 5th process of the above makes conditions of the optimal judgment of the above-mentioned combination pattern so the optimal that the sum of squares of the above-mentioned overall characteristic is small.

[Claim 9]How to manufacture combining two or more parts according to claim 1, wherein the 5th process of the above makes conditions of the optimal judgment of the above-mentioned combination pattern so the optimal that a variance of the above-mentioned overall characteristic is small.

[Claim 10]Conditions of the optimal judgment of the above-mentioned combination pattern, so that the 5th process of the above has many parts which a combination pattern covers, How to manufacture combining two or more parts according to claim 1 supposing that it is the optimal in combination at the time of presupposing that it is so good that a variance of the above-mentioned overall characteristic is so small that the sum of squares of the above-mentioned overall characteristic is small.

[Claim 11]How to manufacture combining two or more parts according to claim 1, wherein the 3rd process of the above is distinguished by identifier contained in it in data registered [above-mentioned] provisionally.

[Claim 12]How to manufacture at claims 1 thru/or 11, wherein the above-mentioned product is a light amplifier combining two or more parts of a statement in any 1 paragraph.

[Claim 13]A method of manufacturing combining two or more parts according to claim 12, comprising: The above-mentioned parts assemble the above-mentioned light amplifier, and are the erbium doped fiber amplifier of a ****** sake.

An isolator.

An optical coupler.

An equalizer.

[Claim 14]How to manufacture combining two or more parts according to claim 13, wherein the demand characteristics of the above-mentioned missing item parts are the wavelength characteristics of a gain and a loss.

[Claim 15]How to manufacture at claims 1 thru/or 11, wherein the above-mentioned product is the high-frequency amplifier combining two or more parts of a statement in any 1 paragraph.

[Claim 16]A method of manufacturing combining two or more parts according to claim 14, comprising: The above-mentioned parts are amplifier devices.

A resistor.

An inductor.

A capacitor.

[Claim 17]How to manufacture combining two or more parts according to claim 16, wherein the demand characteristics of the above-mentioned missing item parts are frequency characteristics.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]In this invention, even when a product is manufactured combining two or more
parts and a missing item is in parts, the characteristic data of missing item parts is generated
according to statistical distribution.
Therefore, it becomes possible to determine the combination of an existing part, and is related with
the method of manufacturing combining two or more parts which enabled it to shorten an assembly-
operation process.

[0002]
[Description of the Prior Art]Although the characteristic of a product turns into the characteristic
which all the parts which assemble a product compounded, the parts which an assembly of all the
products takes do not necessarily gather simultaneously. However, it is more desirable to perform a
sub-assembly, in order to be lead time {lead time (henceforth LT)} shortening, when it is possible to
assemble a product selectively using available parts when assembling a product. Even if all the
component-characteristics spec. is made severe and it combines which part, dedicating the
compound overall characteristic in a standard is also considered, but generally each part price will
become high in that case.
[0003]
[Problem(s) to be Solved by the Invention]Thus, when manufacturing a product conventionally
combining two or more parts, even if it combines which part, in dedicating the compound overall
characteristic in a standard, SUBJECT that the prices of each parts become high occurs. As
approximation art, for example to JP,06-296106,A (manufacturing installation of a microwave circuit
module). While an active functional device swerves from each characteristic inspection result of the
active functional device immediately after manufacture, making it correspond to **, memorizing and
determining the combination of each active functional device based on this memory content, When
the weighted solidity which computed and computed the weighted solidity of the combination based
on the characteristic inspection result of each active functional device of the determined
combination is outside a prescribed range, Calculating the contents of adjustment to adjust and its
amount of adjustments, and processing a substrate based on the result of an operation is indicated
so that the weighted solidity may become within the limits of predetermined. However, in the case of
this gazette, the solution of the point that the part price in the case of making it the above compound
overall characteristics store in a standard becomes high is not indicated.
[0004]The purpose of this invention is as follows.
It was made in order to solve above-mentioned conventional SUBJECT, and an assembly of a
product should become possible related beforehand at the existence of an existing part.
Also when a missing item is solved and you complete a product combining the part, make high a
possibility of assembling so that the overall characteristic may be satisfied, and, moreover, provide
the possibility of shortening of LT, and the method of manufacturing combining two or more parts
which can reduce cost.

[0005]
[Means for Solving the Problem]To achieve the above objects, this invention is characterized by a

method of manufacturing combining two or more parts comprising the following.
The 1st process of judging existence of missing item parts which cannot obtain among two or more parts taken to assemble and to manufacture a product, and are missing items.
A required data number is set to setting out of a variance from which the above-mentioned missing item parts are expected after setting up average value based on a designed value for the demand characteristics of missing item parts in the 1st process of the above at the time of a judgment with the above-mentioned missing item parts, And the 2nd process that generates false normal distribution value characteristic data based on the above-mentioned average value, a variance, and a data number, and is registered provisionally as missing item component-characteristics data.
The 3rd process of reading characteristic data of all the parts containing data registered [above-mentioned] provisionally after parts data required for manufacture of the above-mentioned product was assembled.
The 4th process of computing overall-characteristic data with which it was satisfied of a standard from characteristic data of each parts which chose one part from characteristic data of parts by which reading appearance was carried out [above-mentioned], and generated and combined each part article type combination pattern, The 5th process of attaching and saving an identifier to parts data of the above-mentioned provisional registration to the time of judgment that the above-mentioned combination pattern is the optimal so that discernment from combination with acquisition parts may be possible after the part acquisition.
Therefore, setting out of a variance from which missing item parts are expected after setting out of average value based on a designed value of the demand characteristics of missing item parts when there are missing item parts, Set up a required data number, generate false normal distribution characteristic data based on this average value, a variance, and a data number, and missing item component-characteristics data is registered provisionally as raw data parts data, Read characteristic data of all the parts containing parts data registered provisionally, and characteristic data of some parts is chosen, Overall-characteristic data is computed from characteristic data of each parts data which generated and combined a selection pattern of each part article, Since an identifier was given to parts data of provisional registration so that re-combination with acquisition parts might be possible after the part acquisition when a combination pattern was the optimal, While an assembly of a product becomes possible related beforehand at existence of an existing part, Also when a missing item is solved and it completes a product combining the part, a possibility of assembling so that the overall characteristic may be satisfied can be made high, and, moreover, reduction of the possibility of shortening of LT and cost is attained.
[0006]
[Embodiment of the Invention]Next, the embodiment of the method of manufacturing combining two or more parts depended on this invention is described based on a drawing. This invention so that the overall characteristic may be satisfied allowing a certain amount of component-characteristics variation, When the characteristic data of the existing parts which are received parts, and the missing item parts data which gave statistical variation perform combination and missing item parts come to hand, a possibility that there are parts with which it is satisfied of the overall characteristic is in a high state, and it is made possible [assembling only an existing part previously]. Therefore, even when manufacturing a product, two or more parts are assembled and a missing item is in parts, by generating the characteristic data of missing item parts according to statistical distribution, it becomes possible to determine the combination of an existing part, and an assembly-operation process can be shortened.
[0007]As shown in the flow chart of drawing 1 for describing a 1st embodiment of this invention, generation of the characteristic data based on this statistical distribution, It is constituted by the step which sets up the step variance which sets up a designed value (average value), the step which sets up the number of generated data, and the step which generates a normal distribution. Next, a 1st embodiment of this invention is described along with the flow chart of this drawing 1. Although the object products in particular to manufacture are not limited when describing this 1st embodiment, if an example is given in order to make an understanding of this 1st embodiment easy, the light amplifier in the undersea repeater of an optical cable, the high-frequency amplifier, etc. correspond, for example.
[0008]Among these, it is considered as the parts which assemble the former light amplifier as a

product, and it is EDFA (erbium doped fiber amplifier), an isolator, an optical coupler, an equalizer, etc., and the wavelength characteristic of a gain/loss, etc. can be mentioned as demand characteristics of these parts, for example. It is considered as the parts which assemble the latter high-frequency amplifier as a product, and it is an amplifier device, a resistor (R), an inductor (L), a capacitor (C), etc., and these frequency characteristics are made into demand characteristics, for example.

[0009]Now, in the system which searches for combination with such optimal parts, manufacture of the product which combines five parts, the part type A, the part type B, the part type C, the part type D, and the part type E, is considered by this 1st embodiment. It says here that the missing item has not obtained the part type C, for example. The characteristic as a product shall be computed from the characteristic data of five sorts of parts.

[0010]First, the case where there are missing item parts is explained. Now, suppose that the part type B and the part type E were missing items. When there is a missing item, the part type B is judged to be a missing item at Step S1 of judgment of missing item existence, and the average value (designed value) based on the designed value of part type B demand characteristics is set up to this missing item part at Step S2 which sets up a designed value.

[0011]Next, in Step S3 which sets up a variance (standard deviation), a required data number is set up in step S4 which sets up the variance expected and sets up the number of generated data. Next, based on these three data "average value", the "variance", and the "data number" which were set up previously, In Step S6 which registers provisionally at Step S5 which generates a normal distribution by using as component-characteristics data the data which generated the false normal distribution and was generated, it registers provisionally as parts data intact type B (preservation).

[0012]Next, the part type E is again judged to be a missing item at Step S1 of missing item existence judgment, and like a part type B case, processing of the above-mentioned step S2 – Step S6 is performed, and it registers provisionally as parts data intact part type E based on the designed value of part type E demand characteristics. Thus, the characteristic processing 100 of the missing item parts by processing to Step S2 – Step S6 is ended.

[0013]Next, in order to manufacture a product, after parts data required for combination is assembled, check the existence at Step S7 which judges whether there are any parts combined with provisional registration data, but. If the case where there is this [no] is considered now in order to give explanation simple, processing of Step S8 which acquires the combination information on combination with provisional registration data from this step S7 will be jumped, In step S9 which reads component-characteristics data, all characteristic data the part type A, the part type B, the part type C, the part type D, and part type E including provisional registration data is read.

[0014]At subsequently, the step S10 which chooses one part from each part article group, and generates combination. The overall characteristic of each combination is searched for from a combination pattern at Step S11 which computes overall-characteristic data from the characteristic data of each parts which generated, chose and combined the combination pattern the part type A, the part type B, the part type C, the part type D, and part type E.

[0015]Thus, are satisfied with Step S12 which judges whether combination is the optimal of an overall-characteristic standard to one called-for combination pattern, And processing of the above-mentioned step S10 – Step S12 is repeated until it can choose the pattern of the combination considered to be the optimal based on a certain valuation function. Here, the number of parts (it is so good that it is large) which the combination pattern covers, the sum of squares (it is so good that it is small) of the overall characteristic, the variances (it is so good that it is small) of the overall characteristic, and these composites can be considered to be a certain valuation functions, for example.

[0016]In Step S13 which saves combination information when the combination information of the combination pattern judged to be the optimal is judged to be the optimal in the above-mentioned step S12, After part acquisition, the parts data of provisional registration attaches an identifier for a certain thing to be understood so that re-combination with acquisition parts may be possible. If missing item parts come to hand after creating and combining provisional registration data by the above-mentioned processing, it will be detected by the previous identifier at Step S7 which judges whether there are any parts combined with the above-mentioned provisional registration data that there are such parts.

[0017]At in this case, the step S8 which acquires the combination information on combination with provisional registration data. The information on the already combined pattern (combination pattern the part type A, the part type C, and part type D) is acquired, In step S9 which reads the above-mentioned component-characteristics data, all the characteristic data of each part article is read, The pattern remains as it is by the information on the pattern which the point already combined at Step S10 which chooses one part from the above-mentioned each part article group, and generates combination, Parts the part type B which are the parts which came to hand newly, and part type E are combined, a combination pattern the part type A, the part type B, the part type C, the part type D, and part type E is generated, and the optimal combination is searched for by the same processing as the point. From the start, as well as the processing after above-mentioned missing item acquisition when there is no missing item, it can process.

[0018]If combination is completed after all the parts have gathered, when the processing which attaches the identifier which deletes provisional registration data, deletes each part article data, or shows that it is used is judged to be the above-mentioned optimum, it will carry out at Step S13 which saves combination information.

[0019]Thus, so that it may be satisfied with a 1st embodiment of the overall characteristic, allowing a certain amount of component-characteristics variation, A possibility that there are parts with which it is satisfied of the overall characteristic when the characteristic data of the existing parts which are received parts, and the missing item parts data which gave statistical variation perform combination and missing item parts come to hand in the high state. Also when it becomes possible to assemble only an existing part previously, a missing item is solved and it completes a product combining the part, while a possibility of assembling so that the overall characteristic may be satisfied is high, Since it is not necessary to make the characteristic standard of parts severe in order to take variation into consideration, cost can be lowered with LT shortening.

[0020]Next, a 2nd embodiment of this invention is described. In the case where the option of the characteristic processing 100 of the missing item parts to Step S6 which registers provisionally the data generated from Step S2 which sets up the designed value (average value) in a 1st embodiment of the above as this 2nd embodiment as component-characteristics data is performed, In the manipulation routine replaced with the characteristic processing 100 of the missing item parts in drawing 1 as shown in the flow chart of drawing 2, It replaced with Step S5 which generates the normal distribution data in drawing 1 to the 1st example of an embodiment including Step S21 which performs the statistical work of component-characteristics data, and has replaced by Step S22 which generates the distribution based on statistical work data.

[0021]It may be made for the step which computes a required number automatically with the number of existing parts to be included to a 1st embodiment as a 3rd embodiment of this invention about step S4 which sets up the number of generated data. As a 4th embodiment of this invention, to a 1st embodiment, that generation method shall not be based on distribution, but shall only be based on a random number in Step S5 which generates normal distribution data. Although some data exists as a 5th embodiment of this invention, when a data number with other parts does not suit to a 1st embodiment, it may be made to have a step which generates the data which runs short so that it may become a normal distribution also including the existing data.

[0022]
[Effect of the Invention]As mentioned above, so that the overall characteristic may be satisfied according to this invention, allowing a certain amount of component-characteristics variation, A possibility that there are parts with which it is satisfied of the overall characteristic when the characteristic data of the existing parts which are received parts, and the missing item parts data which gave statistical variation perform combination and missing item parts come to hand in the high state. Since only the existing part was assembled previously, it cannot be concerned with the existence of a missing item, but an existing part can be assembled beforehand. Also when a missing item is solved and it completes a product combining the part, it is effective in a possibility of assembling so that the overall characteristic may be satisfied being high. Since it is not necessary to make the characteristic standard of parts severe in order to take variation into consideration, it is effective in lowering cost with LT shortening.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]In this invention, even when a product is manufactured combining two or more parts and a missing item is in parts, the characteristic data of missing item parts is generated according to statistical distribution.
Therefore, it becomes possible to determine the combination of an existing part, and is related with the method of manufacturing combining two or more parts which enabled it to shorten an assembly-operation process.

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PRIOR ART

[Description of the Prior Art]Although the characteristic of a product turns into the characteristic which all the parts which assemble a product compounded, the parts which an assembly of all the products takes do not necessarily gather simultaneously. However, it is more desirable to perform a sub-assembly, in order to be lead time (lead time (henceforth LT)) shortening, when it is possible to assemble a product selectively using available parts when assembling a product. Even if all the component-characteristics spec. is made severe and it combines which part, dedicating the compound overall characteristic in a standard is also considered, but generally each part price will become high in that case.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, so that it may be satisfied with this invention of the overall characteristic, allowing a certain amount of component-characteristics variation, The characteristic data of the existing parts which are received parts, and the missing item parts data which gave statistical variation performed combination, and when missing item parts came to hand, a possibility that there were parts with which it is satisfied of the overall characteristic assembled only the existing part previously in the high state.

Therefore, it cannot be concerned with the existence of a missing item, but an existing part can be assembled beforehand.

Also when a missing item is solved and it completes a product combining the part, it is effective in a possibility of assembling so that the overall characteristic may be satisfied being high. Since it is not necessary to make the characteristic standard of parts severe in order to take variation into consideration, it is effective in lowering cost with LT shortening.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Thus, when manufacturing a product conventionally combining two or more parts, even if it combines which part, in dedicating the compound overall characteristic in a standard, SUBJECT that the prices of each parts become high occurs. As approximation art, for example to JP,06-296106,A (manufacturing installation of a microwave circuit module). While an active functional device swerves from each characteristic inspection result of the active functional device immediately after manufacture, making it correspond to **, memorizing and determining the combination of each active functional device based on this memory content, When the weighted solidity which computed and computed the weighted solidity of the combination based on the characteristic inspection result of each active functional device of the determined combination is outside a prescribed range, Calculating the contents of adjustment to adjust and its amount of adjustments, and processing a substrate based on the result of an operation is indicated so that the weighted solidity may become within the limits of predetermined. However, in the case of this gazette, the solution of the point that the part price in the case of making it the above compound overall characteristics store in a standard becomes high is not indicated.
[0004]The purpose of this invention is as follows.
It was made in order to solve above-mentioned conventional SUBJECT, and an assembly of a product should become possible related beforehand at the existence of an existing part.
Also when a missing item is solved and you complete a product combining the part, make high a possibility of assembling so that the overall characteristic may be satisfied, and, moreover, provide the possibility of shortening of LT, and the method of manufacturing combining two or more parts which can reduce cost.

[Translation done.]

MEANS

[Means for Solving the Problem]To achieve the above objects, this invention is characterized by a
method of manufacturing combining two or more parts comprising the following.
The 1st process of judging existence of missing item parts which cannot obtain among two or more
parts taken to assemble and to manufacture a product, and are missing items.
A required data number is set to setting out of a variance from which the above-mentioned missing
item parts are expected after setting up average value based on a designed value for the demand
characteristics of missing item parts in the 1st process of the above at the time of a judgment with
the above-mentioned missing item parts, And the 2nd process that generates false normal
distribution value characteristic data based on the above-mentioned average value, a variance, and a
data number, and is registered provisionally as missing item component-characteristics data.
The 3rd process of reading characteristic data of all the parts containing data registered [above-
mentioned] provisionally after parts data required for manufacture of the above-mentioned product
was assembled.
The 4th process of computing overall-characteristic data with which it was satisfied of a standard
from characteristic data of each parts which chose one part from characteristic data of parts by
which reading appearance was carried out [above-mentioned], and generated and combined each
part article type combination pattern, The 5th process of attaching and saving an identifier to parts
data of the above-mentioned provisional registration to the time of judgment that the above-
mentioned combination pattern is the optimal so that discernment from combination with acquisition
parts may be possible after the part acquisition.
Therefore, setting out of a variance from which missing item parts are expected after setting out of
average value based on a designed value of the demand characteristics of missing item parts when
there are missing item parts, Set up a required data number, generate false normal distribution
characteristic data based on this average value, a variance, and a data number, and missing item
component-characteristics data is registered provisionally as raw data parts data, Read
characteristic data of all the parts containing parts data registered provisionally, and characteristic
data of some parts is chosen, Overall-characteristic data is computed from characteristic data of
each parts data which generated and combined a selection pattern of each part article, Since an
identifier was given to parts data of provisional registration so that re-combination with acquisition
parts might be possible after the part acquisition when a combination pattern was the optimal, While
an assembly of a product becomes possible related beforehand at existence of an existing part, Also
when a missing item is solved and it completes a product combining the part, a possibility of
assembling so that the overall characteristic may be satisfied can be made high, and, moreover,
reduction of the possibility of shortening of LT and cost is attained.
[0006]
[Embodiment of the Invention]Next, the embodiment of the method of manufacturing combining two
or more parts depended on this invention is described based on a drawing. This invention so that the
overall characteristic may be satisfied allowing a certain amount of component-characteristics
variation, When the characteristic data of the existing parts which are received parts, and the missing
item parts data which gave statistical variation perform combination and missing item parts come to
hand, a possibility that there are parts with which it is satisfied of the overall characteristic is in a
high state, and it is made possible [assembling only an existing part previously]. Therefore, even
when manufacturing a product, two or more parts are assembled and a missing item is in parts, by

generating the characteristic data of missing item parts according to statistical distribution, it becomes possible to determine the combination of an existing part, and an assembly-operation process can be shortened.

[0007]As shown in the flow chart of drawing 1 for describing a 1st embodiment of this invention, generation of the characteristic data based on this statistical distribution, It is constituted by the step which sets up the step variance which sets up a designed value (average value), the step which sets up the number of generated data, and the step which generates a normal distribution. Next, a 1st embodiment of this invention is described along with the flow chart of this drawing 1. Although the object products in particular to manufacture are not limited when describing this 1st embodiment, if an example is given in order to make an understanding of this 1st embodiment easy, the light amplifier in the undersea repeater of an optical cable, the high-frequency amplifier, etc. correspond, for example.

[0008]Among these, it is considered as the parts which assemble the former light amplifier as a product, and it is EDFA (erbium doped fiber amplifier), an isolator, an optical coupler, an equalizer, etc., and the wavelength characteristic of a gain/loss, etc. can be mentioned as demand characteristics of these parts, for example. It is considered as the parts which assemble the latter high-frequency amplifier as a product, and it is an amplifier device, a resistor (R), an inductor (L), a capacitor (C), etc., and these frequency characteristics are made into demand characteristics, for example.

[0009]Now, in the system which searches for combination with such optimal parts, manufacture of the product which combines five parts, the part type A, the part type B, the part type C, the part type D, and the part type E, is considered by this 1st embodiment. It says here that the missing item has not obtained the part type C, for example. The characteristic as a product shall be computed from the characteristic data of five sorts of parts.

[0010]First, the case where there are missing item parts is explained. Now, suppose that the part type B and the part type E were missing items. When there is a missing item, the part type B is judged to be a missing item at Step S1 of judgment of missing item existence, and the average value (designed value) based on the designed value of part type B demand characteristics is set up to this missing item part at Step S2 which sets up a designed value.

[0011]Next, in Step S3 which sets up a variance (standard deviation), a required data number is set up in step S4 which sets up the variance expected and sets up the number of generated data. Next, based on these three data "average value", the "variance", and the "data number" which were set up previously, In Step S6 which registers provisionally at Step S5 which generates a normal distribution by using as component-characteristics data the data which generated the false normal distribution and was generated, it registers provisionally as parts data intact type B (preservation).

[0012]Next, the part type E is again judged to be a missing item at Step S1 of missing item existence judgment, and like a part type B case, processing of the above-mentioned step S2 – Step S6 is performed, and it registers provisionally as parts data intact part type E based on the designed value of part type E demand characteristics. Thus, the characteristic processing 100 of the missing item parts by processing to Step S2 – Step S6 is ended.

[0013]Next, in order to manufacture a product, after parts data required for combination is assembled, check the existence at Step S7 which judges whether there are any parts combined with provisional registration data, but. If the case where there is this [no] is considered now in order to give explanation simple, processing of Step S8 which acquires the combination information on combination with provisional registration data from this step S7 will be jumped, In step S9 which reads component-characteristics data, all characteristic data the part type A, the part type B, the part type C, the part type D, and part type E including provisional registration data is read.

[0014]At subsequently, the step S10 which chooses one part from each part article group, and generates combination. The overall characteristic of each combination is searched for from a combination pattern at Step S11 which computes overall-characteristic data from the characteristic data of each parts which generated, chose and combined the combination pattern the part type A, the part type B, the part type C, the part type D, and part type E.

[0015]Thus, are satisfied with Step S12 which judges whether combination is the optimal of an overall-characteristic standard to one called-for combination pattern, And processing of the above-mentioned step S10 – Step S12 is repeated until it can choose the pattern of the combination

considered to be the optimal based on a certain valuation function. Here, the number of parts (it is so good that it is large) which the combination pattern covers, the sum of squares (it is so good that it is small) of the overall characteristic, the variances (it is so good that it is small) of the overall characteristic, and these composites can be considered to be a certain valuation functions, for example.

[0016]In Step S13 which saves combination information when the combination information of the combination pattern judged to be the optimal is judged to be the optimal in the above-mentioned step S12, After part acquisition, the parts data of provisional registration attaches an identifier for a certain thing to be understood so that re-combination with acquisition parts may be possible. If missing item parts come to hand after creating and combining provisional registration data by the above-mentioned processing, it will be detected by the previous identifier at Step S7 which judges whether there are any parts combined with the above-mentioned provisional registration data that there are such parts.

[0017]At in this case, the step S8 which acquires the combination information on combination with provisional registration data. The information on the already combined pattern (combination pattern the part type A, the part type C, and part type D) is acquired, In step S9 which reads the above-mentioned component-characteristics data, all the characteristic data of each part article is read, The pattern remains as it is by the information on the pattern which the point already combined at Step S10 which chooses one part from the above-mentioned each part article group, and generates combination, Parts the part type B which are the parts which came to hand newly, and part type E are combined, a combination pattern the part type A, the part type B, the part type C, the part type D, and part type E is generated, and the optimal combination is searched for by the same processing as the point. From the start, as well as the processing after above-mentioned missing item acquisition when there is no missing item, it can process.

[0018]If combination is completed after all the parts have gathered, when the processing which attaches the identifier which deletes provisional registration data, deletes each part article data, or shows that it is used is judged to be the above-mentioned optimum, it will carry out at Step S13 which saves combination information.

[0019]Thus, so that it may be satisfied with a 1st embodiment of the overall characteristic, allowing a certain amount of component-characteristics variation, A possibility that there are parts with which it is satisfied of the overall characteristic when the characteristic data of the existing parts which are received parts, and the missing item parts data which gave statistical variation perform combination and missing item parts come to hand in the high state. Also when it becomes possible to assemble only an existing part previously, a missing item is solved and it completes a product combining the part, while a possibility of assembling so that the overall characteristic may be satisfied is high, Since it is not necessary to make the characteristic standard of parts severe in order to take variation into consideration, cost can be lowered with LT shortening.

[0020]Next, a 2nd embodiment of this invention is described. In the case where the option of the characteristic processing 100 of the missing item parts to Step S6 which registers provisionally the data generated from Step S2 which sets up the designed value (average value) in a 1st embodiment of the above as this 2nd embodiment as component-characteristics data is performed, In the manipulation routine replaced with the characteristic processing 100 of the missing item parts in drawing 1 as shown in the flow chart of drawing 2, It replaced with Step S5 which generates the normal distribution data in drawing 1 to the 1st example of an embodiment including Step S21 which performs the statistical work of component-characteristics data, and has replaced by Step S22 which generates the distribution based on statistical work data.

[0021]It may be made for the step which computes a required number automatically with the number of existing parts to be included to a 1st embodiment as a 3rd embodiment of this invention about step S4 which sets up the number of generated data. As a 4th embodiment of this invention, to a 1st embodiment, that generation method shall not be based on distribution, but shall only be based on a random number in Step S5 which generates normal distribution data. Although some data exists as a 5th embodiment of this invention, when a data number with other parts does not suit to a 1st embodiment, it may be made to have a step which generates the data which runs short so that it may become a normal distribution also including the existing data.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a flow chart for describing a 1st embodiment of the method of manufacturing
combining two or more copy article by this invention.
[Drawing 2]It is a flow chart of the characteristic manipulation routine of the missing item parts for
describing a 2nd embodiment of the method of manufacturing combining two or more copy article by
this invention.
[Description of Notations]
S1 .... The step judged about whether there is any missing item or there is nothing, S2 .... The step
which sets up a designed value (preset value), S3 .... The step, S4 which set up a variance .... The
step which sets up the number of generated data, S5 .... The step, S6 which generate a normal
distribution .... The step which registers provisionally by using the generated data as component-
characteristics data, S7 .... The step which judges whether there are any parts combined with
provisional registration data, S8 .... The step which acquires the combination information on
combination with provisional registration data, S9 .... The step, S10 which read component-
characteristics data .... One part is chosen from each parts group, The step, S11 which generate
combination .... from the characteristic data of each combined parts. The step, S12 which compute
overall-characteristic data .... The step which judges whether combination is the optimal, S13 .... The
step, S21 which combine and save information when it is judged that it is the optimal .... The step,
S22 which perform the statistical work of component-characteristics data .... Step which generates
the distribution based on statistical work data.

[Translation done.]
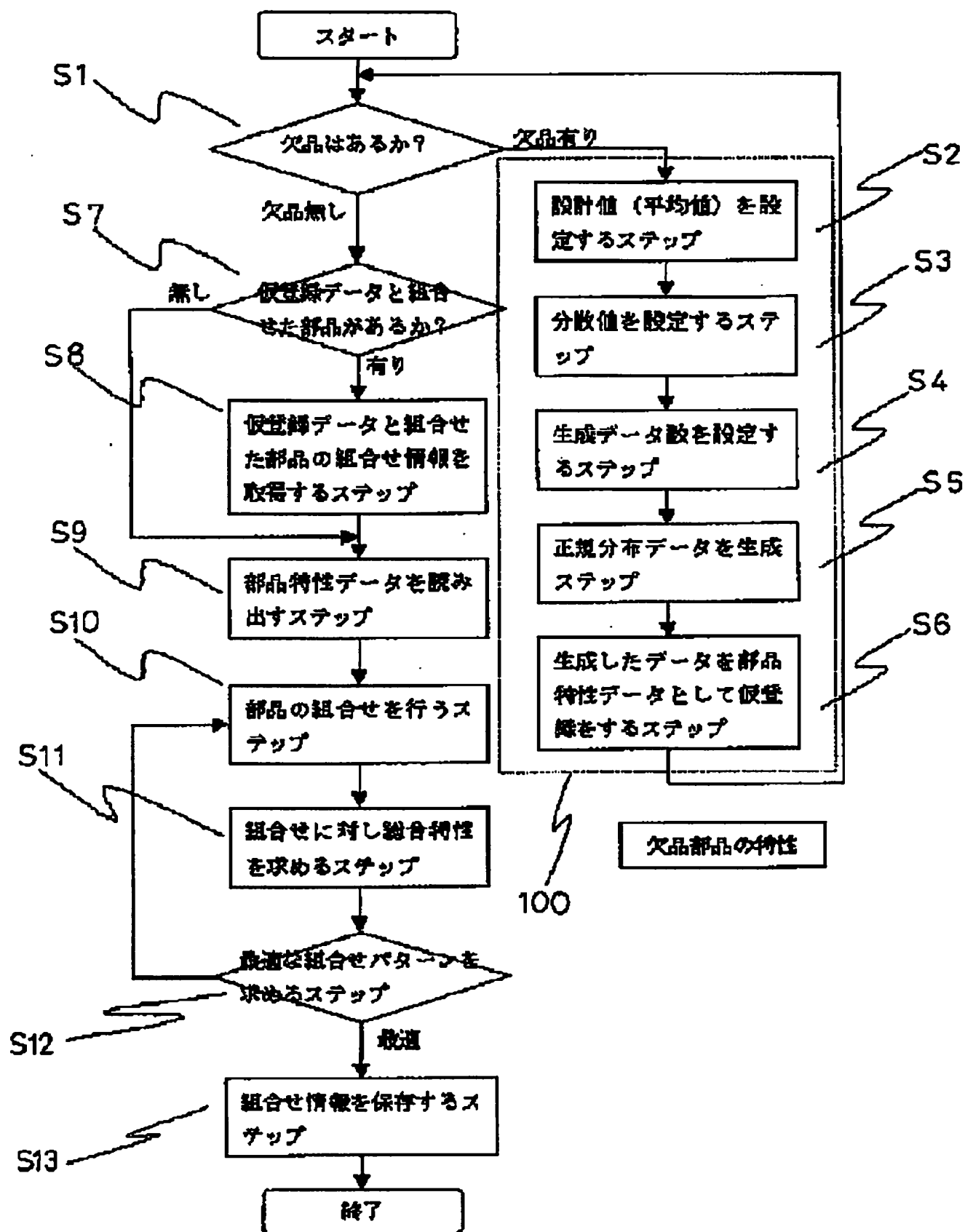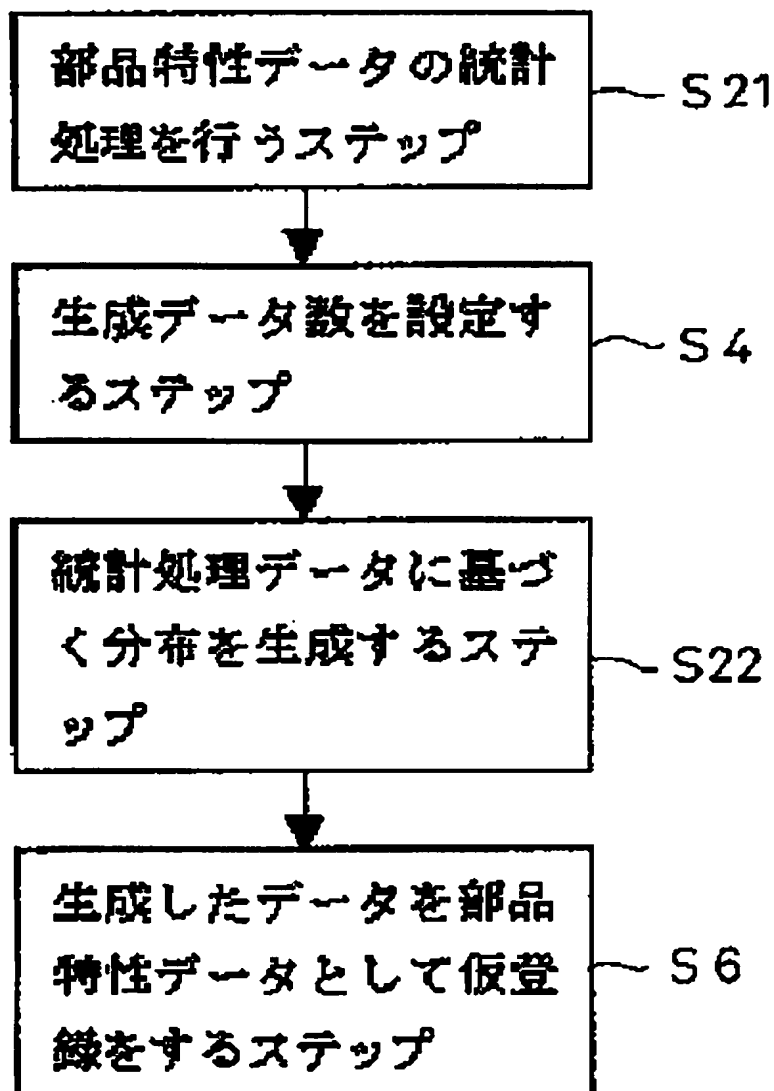
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                    ┌──────────────┐
                    │   スタート    │
                    └──────────────┘
                           │
        S1                 ▼
             ╱◇╲                                    欠品有り
            ╱欠品はあるか？╲──────────────────────┐        S2
            ╲             ╱                        │
             ╲◇╱                                   ▼
              │ 欠品無し                   ┌──────────────────┐
   S7         │                           │ 設計値（平均値）を設 │
              ▼                           │ 定するステップ      │
        ╱◇╲                              └──────────────────┘
  無し ╱仮登録データと組合╲                        │          S3
  ┌──╱ せた部品があるか？ ╲                        ▼
  │  ╲               ╱                   ┌──────────────────┐
  │   ╲◇╱                               │ 分散値を設定するステ │
  │     │ 有り                           │ ップ              │
  │     ▼                               └──────────────────┘
  │ ┌──────────────────┐                       │          S4
  │ │ 仮登録データと組合せ │                       ▼
S8│ │ た部品の組合せ情報を │            ┌──────────────────┐
  │ │ 取得するステップ    │            │ 生成データ数を設定す │
  │ └──────────────────┘            │ るステップ         │
  │     │                           └──────────────────┘
  │     ▼                                  │          S5
  │ ┌──────────────────┐                  ▼
S9│ │ 部品特性データを読み │            ┌──────────────────┐
  │ │ 出すステップ       │            │ 正規分布データを生成 │
  │ └──────────────────┘            │ ステップ           │
  │     │                           └──────────────────┘
  │     ▼                                  │          S6
S10│┌──────────────────┐                  ▼
  └▶│ 部品の組合せを行うス │            ┌──────────────────┐
   │ テップ            │            │ 生成したデータを部品 │
   └──────────────────┘            │ 特性データとして仮登 │
        │                           │ 録をするステップ    │
        ▼                           └──────────────────┘
S11 ┌──────────────────┐                  │
    │ 組合せに対し総合相性 │                 100
    │ を求めるステップ    │            ┌──────────────────┐
    └──────────────────┘            │  欠品部品の特性      │
        │                           └──────────────────┘
        ▼
      ╱◇╲
     ╱最適な組合せパターンを╲
  ┌─╱ 求めるステップ      ╲
  │  ╲               ╱
  │   ╲◇╱
S12     │ 最適
        ▼
   ┌──────────────────┐
   │ 組合せ情報を保存するス │
   │ テップ            │
   └──────────────────┘
S13     │
        ▼
   ┌──────────────┐
   │    終了       │
   └──────────────┘
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┌─────────────────────────┐
│ 部品特性データの統計      │ ～ S21
│ 処理を行うステップ        │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ 生成データ数を設定す      │ ～ S4
│ るステップ                │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ 統計処理データに基づ      │
│ く分布を生成するステ      │ ～ S22
│ ップ                      │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ 生成したデータを部品      │
│ 特性データとして仮登      │ ～ S6
│ 録をするステップ          │
└─────────────────────────┘
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(51)Int.Cl.⁷	識別記号	F I	テーマコード°（参考）
H 0 5 K　13/00		H 0 5 K　13/00	Y　5E313

(54)【発明の名称】　　複数の部品を組み合わせて製造する方法

(57)【要約】

【課題】　欠品解消後欠品部品を組み合わせても、総合特性を満足でき、リードタイムを短縮できる複数部品を組み合わせて製造する方法を提供すること。

【解決手段】　欠品があると（ステップS1）、欠品部品の要求特性の設計値に基づく平均値設定後（ステップS2）、欠品部品の分散値の設定（ステップS3）と、必要データ数とを設定し（ステップS4）、これらの値を基に疑似正規分布特性データを生成し（ステップS5）、欠品部品特性データを未使用データ部品として仮登録し（ステップS6）た部品データを含むすべての部品の特性データを読み出し（ステップS9）て一部の部品の特性データを選択し、各部品の選択パターンを生成して組み合わせた個々の部品データの特性データより総合特性データを算出し（ステップS12）、最適組み合わせパターンを求める（ステップS12）。
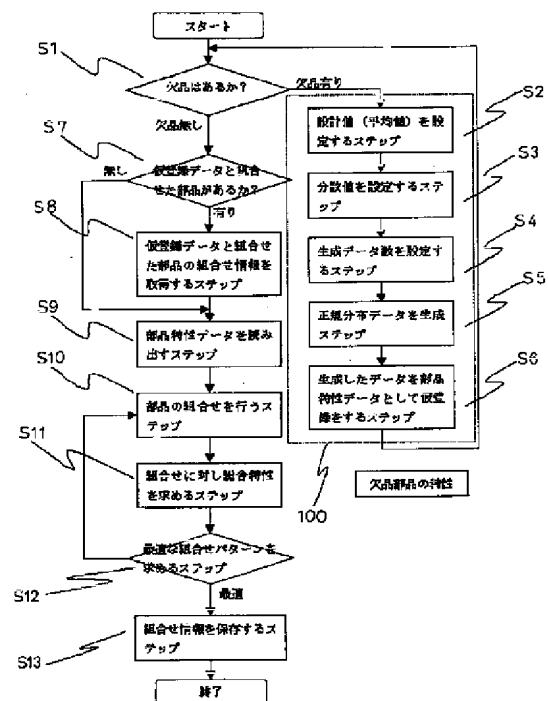
【特許請求の範囲】

【請求項1】 組み立てて製品を製造するのに要する複数の部品のうち入手できなくて欠品になっている欠品部品の有無を判定する第1工程と、

上記第1工程において上記欠品部品ありの判定時に欠品部品の要求特性を設計値に基づく平均値を設定した後に上記欠品部品の期待される分散値の設定と必要なデータ数を設定し、かつ上記平均値、分散値およびデータ数を基に疑似正規分布値特性データを発生して、欠品部品特性データとして仮登録する第2工程と、

上記製品の製造に必要な部品データが揃った後に上記仮登録されたデータを含むすべての部品の特性データを読み出す第3工程と、

上記読み出された部品の特性データから1部品を選択して各部品タイプの組み合わせパターンを生成して組み合わせた個々の部品の特性データより規格を満足した総合特性データを算出する第4工程と、

上記組み合わせパターンが最適であるとの判断時に上記仮登録の部品データに対してその部品入手後に入手部品との組み合わせとの識別が可能なように識別子を付して保存する第5工程と、

を含むことを特徴とする複数の部品を組み合わせて製造する方法。

【請求項2】 上記第2工程は、上記第1工程で欠品部品ありと判定するごとに、新たに判定された欠品部品の要求特性の設計値に基づき未使用の部品データとして仮登録することを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項3】 上記第2工程は、上記第1工程において上記欠品部品ありの判定時に欠品部品特性データの統計処理を行って統計処理データを生成した後に必要なデータ数を設定し、かつ上記統計処理データに基づく疑似正規分布データを生成してこの分布データを欠品部品特性データとして仮登録することを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項4】 上記第2工程は、上記第1工程において上記欠品部品ありの判定時に欠品部品の要求特性を設計値に基づく平均値を設定した後に上記欠品部品の期待される分散値の設定と既存部品数により必要データ数を自動的に算出して発生して、欠品部品特性データを未使用部品データとして仮登録することを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項5】 上記第2工程は、上記第1工程において上記欠品部品ありの判定時に欠品部品の要求特性を設計値に基づく平均値を設定した後に上記欠品の部品の期待される分散値の設定と必要なデータ数を設定し、かつ上記平均値、分散値およびデータ数を基に乱数によりデータを生成して、欠品部品特性データとして仮登録することを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項6】 上記第2工程は、上記第1工程において上記欠品部品ありの判定時に欠品部品の要求特性を設計値に基づく平均値を設定した後に上記欠品部品の期待される分散値の設定と必要なデータ数を設定し、このデータ数と他の部品とのデータ数が合わない場合に既存データを含めて疑似正規分布となるように不足するデータを生成して欠品部品特性データとして仮登録することを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項7】 上記第5工程は、上記組み合わせパターンの最適判断の条件を、網羅する部品数が多いほど最適であるとすることを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項8】 上記第5工程は、上記組み合わせパターンの最適判断の条件を、上記総合特性の自乗和が小さいほど最適であるとすることを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項9】 上記第5工程は、上記組み合わせパターンの最適判断の条件を、上記総合特性の分散値が小さいほど最適であるとすることを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項10】 上記第5工程は、上記組み合わせパターンの最適判断の条件を、組み合わせパターンの網羅する部品数が多いほど、上記総合特性の自乗和が小さいほど、かつ上記総合特性の分散値が小さいほど良いとした場合の組み合わせで最適であるとすることを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項11】 上記第3工程は、上記仮登録されたデータをそれに含まれる識別子により判別されることを特徴とする請求項1記載の複数の部品を組み合わせて製造する方法。

【請求項12】 上記製品は、光増幅器であることを特徴とする請求項1乃至11に何れか1項に記載の複数の部品を組み合わせて製造する方法。

【請求項13】 上記部品は、上記光増幅器を組み立て製造すためのエルビウム添加ファイバアンプと、アイソレータと、光カプラと、イコライザとを含むことを特徴とする請求項12記載の複数の部品を組み合わせて製造する方法。

【請求項14】 上記欠品部品の要求特性は、ゲインとロスの波長特性であることを特徴とする請求項13記載の複数の部品を組み合わせて製造する方法。

【請求項15】 上記製品は、高周波増幅器であることを特徴とする請求項1乃至11に何れか1項に記載の複数の部品を組み合わせて製造する方法。

【請求項16】 上記部品は、アンプデバイスと、抵抗器と、インダクタと、コンデンサとを含むことを特徴とする請求項14記載の複数の部品を組み合わせて製造する方法。

【請求項１７】　上記欠品部品の要求特性は、周波数特性であることを特徴とする請求項１６記載の複数の部品を組み合わせて製造する方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、複数の部品を組み合わせて製品を製造する場合、部品に欠品があった場合でも、欠品部品の特性データを統計分布にしたがって生成することにより、既存部品の組合せを決定することが可能となり、組立作業工程が短縮できるようにした複数の部品を組み合わせて製造する方法に関する。

【０００２】

【従来の技術】製品の特性は、製品を組み立てるすべての部品の合成した特性となるが、すべての製品の組み立てに要する部品が同時に揃うとは限らない。しかし、製品を組み立てる場合に、入手可能な部品を使用して製品を部分的に組み立てることが可能な場合、リードタイム｛ｌｅａｄ　ｔｉｍｅ（以下、ＬＴという）｝短縮のためには、部分組立を行う方が望ましい。すべての部品特性スペックを厳しくして、どの部品を組み合わせても、合成した総合特性を規格内に納めるようにすることも考えられるが、その場合、一般に個々の部品価格が高くなってしまう。

【０００３】

【発明が解決しようとする課題】このように、従来、複数の部品を組み合わせて製品を製造する場合に、どの部品を組み合わせても、合成した総合特性を規格内に納めるようにする場合には、個々の部品の価格が高くなるという課題がある。なお、近似技術としては、たとえば、特開平０６－２９６１０６号公報（マイクロ波回路モジュールの製造装置）には、製造直後の能動機能素子のそれぞれの特性検査結果を能動機能素子のそれぞに対応させて記憶しておき、この記憶内容を基に能動機能素子それぞれの組み合わせを決定するとともに、決定された組み合わせの能動機能素子それぞれの特性検査結果を基にその組み合わせの特性値を算出し、算出した特性値が所定範囲外のときに、その特性値が所定の範囲内になるように、調整する調整内容とその調整量を演算して、その演算結果に基づいて基板を処理することが開示されている。しかし、この公報の場合には、上記のような合成した総合特性が規格内に収めるようにする場合の部品価格が高くなる点の解決策を開示しているものではない。

【０００４】この発明は、上記従来の課題を解決するためになされたもので、既存部品の有無に関係なくあらかじめ製品の組み立てが可能となるとともに、欠品が解消し、その部品を組み合わせて製品を完成させる場合にも、総合特性を満足するように組み立てる可能性を高くすることができ、しかもＬＴの短縮化が可能、かつコストの低減が可能な複数の部品を組み合わせて製造する方法を提供することを目的とする。

【０００５】

【課題を解決するための手段】上記目的を達成するために、この発明の複数の部品を組み合わせて製造する方法は、組み立てて製品を製造するのに要する複数の部品のうち入手できなくて欠品になっている欠品部品の有無を判定する第１工程と、上記第１工程において上記欠品部品ありの判定時に欠品部品の要求特性を設計値に基づく平均値を設定した後に上記欠品部品の期待される分散値の設定と必要なデータ数を設定し、かつ上記平均値、分散値およびデータ数を基に疑似正規分布値特性データを発生して、欠品部品特性データとして仮登録する第２工程と、上記製品の製造に必要な部品データが揃った後に上記仮登録されたデータを含むすべての部品の特性データを読み出す第３工程と、上記読み出された部品の特性データから１部品を選択して各部品タイプの組み合わせパターンを生成して組み合わせた個々の部品の特性データより規格を満足した総合特性データを算出する第４工程と、上記組み合わせパターンが最適であるとの判断時に上記仮登録の部品データに対してその部品入手後に入手部品との組み合わせとの識別が可能なように識別子を付して保存する第５工程とを含むことを特徴とする。そのため、欠品部品があると、欠品部品の要求特性の設計値に基づく平均値の設定後に欠品部品の期待される分散値の設定と、必要なデータ数とを設定し、この平均値、分散値、データ数を基に疑似正規分布特性データを発生して欠品部品特性データを未使用データ部品データとして仮登録し、仮登録した部品データを含むすべての部品の特性データを読み出して一部の部品の特性データを選択し、各部品の選択パターンを生成して組み合わせた個々の部品データの特性データより総合特性データを算出し、組み合わせパターンが最適の場合に、仮登録の部品データに対してその部品入手後に入手部品との再組み合わせが可能なように、識別子を付与するようにしたので、既存部品の有無に関係なくあらかじめ製品の組み立てが可能となるとともに、欠品が解消し、その部品を組み合わせて製品を完成させる場合にも、総合特性を満足するように組み立てる可能性を高くすることができ、しかもＬＴの短縮化が可能、かつコストの低減が可能となる。

【０００６】

【発明の実施の形態】次に、この発明による複数の部品を組み合わせて製造する方法の実施の形態について図面に基づき説明する。この発明は、ある程度の部品特性バラツキを許しながら総合特性を満足するように、入手済み部品である現存する部品の特性データと統計的バラツキを与えた欠品部品データにより組合せを行い、欠品部品を入手したときに総合特性を満足する部品がある可能性が高い状態で、既存部品のみを先に組み立てることが可能となるようにしているものである。したがって、製品を製造する際に複数の部品を組み立てる場合に、部品

に欠品があった場合でも、欠品部品の特性データを統計分布にしたがって生成することにより、既存部品の組合せを決定することが可能となり、組立作業工程が短縮できる。

【０００７】この統計分布による特性データの生成は、この発明の第１実施の形態を説明するための図１のフローチャートに示すように、設計値（平均値）を設定するステップ分散値を設定するステップ、生成データ数を設定するステップ、正規分布を発生するステップにより構成されている。次に、この図１のフローチャートに沿ってこの発明の第１実施の形態を説明する。この第１実施の形態の説明に際して、製造する対象製品が特に限定されるものではないが、この第１実施の形態の理解を容易にするために、一例を挙げると、たとえば、光ケーブルの海底中継器における光増幅器や、高周波増幅器などが該当する。

【０００８】このうち、前者の光増幅器を製品として組み立てる部品として、たとえば、ＥＤＦＡ（エルビウム添加ファイバアンプ）、アイソレータ、光カプラ、イコライザなどであり、これらの部品の要求特性として、ゲイン／ロスの波長特性などを挙げることができる。また、後者の高周波増幅器を製品として組み立てる部品として、たとえば、アンプデバイス、抵抗器（Ｒ）、インダクタ（Ｌ）、コンデンサ（Ｃ）などであり、これらの周波数特性を要求特性とする。

【０００９】さて、このような部品の最適な組合せを求めるシステムにおいて、この第１実施の形態では、部品タイプＡ、部品タイプＢ、部品タイプＣ、部品タイプＤ、部品タイプＥの５つの部品を組合せてなる製品の製造について考える。ここで欠品とは、たとえば、部品タイプＣが入手できていないことをいう。また、製品としての特性は、５種の部品の特性データより算出されるものとする。

【００１０】まず、欠品部品がある場合について説明する。いま、部品タイプＢと部品タイプＥが欠品であったとする。欠品がある場合、欠品有無の判断のステップＳ１で部品タイプＢが欠品であると判断され、この欠品部品に対し、設計値を設定するステップＳ２にて、部品タイプＢの要求特性の設計値に基づく平均値（設計値）を設定する。

【００１１】次に、分散値（標準偏差）を設定するステップＳ３において、期待される分散値の設定を行い、生成データ数を設定するステップＳ４において、必要なデータ数の設定を行う。次に、先に設定したこの３つのデータ「平均値」、「分散値」、「データ数」をもとに、正規分布を発生するステップＳ５にて疑似正規分布を発生し、生成したデータを部品特性データとして仮登録をするステップＳ６において、未使用のタイプＢの部品データとして仮登録（保存）する。

【００１２】次に、再び欠品有無判断のステップＳ１に

て、部品タイプＥが欠品であると判断され、部品タイプＢの場合と同様、上記ステップＳ２～ステップＳ６の処理を実行して、部品タイプＥの要求特性の設計値に基づき、未使用の部品タイプＥの部品データとして仮登録する。このようにして、ステップＳ２～ステップＳ６までの処理による欠品部品の特性処理１００を終了する。

【００１３】次に、製品を製造するために、組み合わせに必要な部品データが揃った後、仮登録データと組合せた部品があるか判断するステップＳ７にて、その存在を確認するが、いま、説明を簡便にするために、これが無い場合を考えると、このステップＳ７から仮登録データとの組み合わせの組み合わせ情報を取得するステップＳ８の処理をジャンプして、部品特性データを読み出すステップＳ９にて、仮登録データを含め、部品タイプＡ、部品タイプＢ、部品タイプＣ、部品タイプＤ、部品タイプＥの特性データをすべて読み出す。

【００１４】次いで、各部品群から１部品を選択し、組み合わせを生成するステップＳ１０にて、部品タイプＡ、部品タイプＢ、部品タイプＣ、部品タイプＤ、部品タイプＥの組合せパターンを生成し、選択して組合せた個々の部品の特性データより、総合特性データを算出するステップＳ１１にて組み合わせパターンに対して、それぞれの組合せの総合特性を求める。

【００１５】このようにして求められた１つの組合せパターンに対し、組合せが最適かどうかを判断するステップＳ１２にて総合特性規格を満足し、かつ何らかの評価関数に基づき最適だと考えられる組合せのパターンが選択できるまで上記ステップＳ１０～ステップＳ１２の処理を繰り返す。ここで、何らかの評価関数とは、たとえば、その組合せパターンの網羅する部品数（多いほど良いなど）や総合特性の自乗和（小さいほど良いなど）や総合特性の分散値（小さいほど良いなど）などや、またこれらの複合が考えられる。

【００１６】上記ステップＳ１２において、最適と判断された組合せパターンの組合せ情報を最適と判断された場合に組合せ情報を保存するステップＳ１３において、仮登録の部品データは部品入手後に入手部品との再組合せが可能なように、それであることがわかるための識別子を付帯する。前述の処理で仮登録データを作成し、組合せた後、欠品部品を入手すると、上記仮登録データと組合せた部品があるか判断するステップＳ７にて先の識別子によってそのような部品があることが検出される。

【００１７】この場合、仮登録データとの組み合わせの組み合わせ情報を取得するステップＳ８にて、既に組み合わせたパターン（部品タイプＡ、部品タイプＣ、部品タイプＤの組合せパターン）の情報を取得し、上記部品特性データを読み出すステップＳ９にて、各部品の特性データをすべて読み出し、上記各部品群から１部品を選択し、組み合せを生成するステップＳ１０にて、先の既に組み合わせたパターンの情報によりそのパターンはそ

のままで、新しく入手した部品である部品タイプＢ、部品タイプＥの部品を組み合せ、部品タイプＡ、部品タイプＢ、部品タイプＣ、部品タイプＤ、部品タイプＥの組み合わせパターンを生成し、先と同様の処理により最適な組合せを求める。初めから欠品が無い場合も、上述の欠品入手後の処理と同様に処理が可能である。

【００１８】すべての部品が揃った状態で組み合せが完了すると、仮登録データを削除し、また、各部品データは削除するかあるいは使用済みであることを示す識別子を付帯する処理を上記最適と判断された場合に組合せ情報を保存するステップＳ１３にて行う。

【００１９】このように、第１実施の形態では、ある程度の部品特性バラツキを許しながら総合特性を満足するように、入手済み部品である現存する部品の特性データと統計的バラツキを与えた欠品部品データにより組合せを行い、欠品部品を入手したときに総合特性を満足する部品がある可能性が高い状態で、既存部品のみを先に組み立てることが可能となり、欠品が解消しその部品を組み合わせて製品を完成させる場合にも、総合特性を満足するように組み立てる可能性が高いとともに、バラツキを考慮するため、部品の特性規格を厳しくする必要がないので、ＬＴ短縮とともにコストを下げることができる。

【００２０】次に、この発明の第２実施の形態について説明する。この第２実施の形態としては、上記第１実施の形態における設計値（平均値）を設定するステップＳ２から生成したデータを部品特性データとして仮登録するステップＳ６までの欠品部品の特性処理１００の別の方法を実行する場合において、図２のフローチャートに示すように、図１における欠品部品の特性処理１００に代わる処理ルーチンにおいて、第１の実施の形態例に対し、部品特性データの統計処理を行うステップＳ２１を含み、図１における正規分布データを生成するステップＳ５に代えて、統計処理データに基づく分布を生成するステップＳ２２に置換している。

【００２１】また、この発明の第３実施の形態として、第１実施の形態に対して、生成データ数を設定するステップＳ４については、既存部品数により必要数を自動で算出するステップを含むようにしてもよい。さらに、この発明の第４実施の形態として、第１の実施の形態に対し、正規分布データを生成するステップＳ５においては、その生成方法が分布によらず単に乱数によるものとすることもできる。この発明の第５実施の形態として、

第１の実施の形態に対し、いくつかのデータが存在するが他の部品とのデータ数が合わない場合に、既存データも含めて正規分布となるように不足するデータを生成するステップを有するようにしてもよい。

【００２２】

【発明の効果】以上のように、この発明によれば、ある程度の部品特性バラツキを許しながら総合特性を満足するように、入手済み部品である現存する部品の特性データと統計的バラツキを与えた欠品部品データにより組合せを行い、欠品部品を入手したときに総合特性を満足する部品がある可能性が高い状態で、既存部品のみを先に組み立てるようにしたので、既存部品を欠品の有無に関わらず、あらかじめ組み立てることができる。また、欠品が解消し、その部品を組み合わせて製品を完成させる場合にも、総合特性を満足するように組み立てる可能性が高いという効果がある。さらに、バラツキを考慮するため、部品の特性規格を厳しくする必要がないので、ＬＴ短縮とともにコストを下げるという効果がある。

【図面の簡単な説明】

【図１】この発明による複数部品を組み合わせて製造する方法の第１実施の形態を説明するためのフローチャートである。

【図２】この発明による複数部品を組み合わせて製造する方法の第２実施の形態を説明するための欠品部品の特性処理ルーチンのフローチャートである。

【符号の説明】

Ｓ１……欠品があるかないかについて判断するステップ、Ｓ２……設計値（設定値）を設定するステップ、Ｓ３……分散値を設定するステップ、Ｓ４……生成データ数を設定するステップ、Ｓ５……正規分布を発生するステップ、Ｓ６……生成したデータを部品特性データとして仮登録をするステップ、Ｓ７……仮登録データと組み合わせた部品があるか判断するステップ、Ｓ８……仮登録データとの組み合わせの組み合わせ情報を取得するステップ、Ｓ９……部品特性データを読み出すステップ、Ｓ１０……各部品群から１部品を選択し、組み合わせを生成するステップ、Ｓ１１……組み合わせた個々の部品の特性データより、総合特性データを算出するステップ、Ｓ１２……組み合わせが最適かどうかを判断するステップ、Ｓ１３……最適と判断された場合に組み合わせ情報を保存するステップ、Ｓ２１……部品特性データの統計処理を行うステップ、Ｓ２２……統計処理データに基づく分布を生成するステップ。

【図1】

【図2】

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         スタート
           │
   ┌───────▼────────┐ 欠品有り
S1 ◇ 欠品はあるか？ ├──────────┐
   └───────┬────────┘          │
       欠品無し                 ▼
           │         ┌──────────────────┐
           ▼         │ 閾計値（平均値）を設 │ S2
S7 ◇ 仮登録データと組合 │ 定するステップ      │
   ◇ せる部品があるか？  └──────────────────┘
   └───────┬────────┘          │
        無し│有り              ▼
           │         ┌──────────────────┐
           ▼         │ 分散値を設定するステ │ S3
S8 ┌─────────────┐   │ ップ               │
   │仮登録データと組合せ│ └──────────────────┘
   │た部品の組合せ情報を│          │
   │取得するステップ    │          ▼
   └──────┬──────┘   ┌──────────────────┐
           │         │ 生成データ数を設定す │ S4
S9 ┌──────▼──────┐   │ るステップ          │
   │部品特性データを読み│ └──────────────────┘
   │出すステップ        │          │
   └──────┬──────┘          ▼
S10┌──────▼──────┐   ┌──────────────────┐
   │部品の組合せを行うス│ │ 正規分布データを生成 │ S5
   │テップ              │ │ ステップ           │
   └──────┬──────┘   └──────────────────┘
S11┌──────▼──────┐          │
   │組合せに対し組合特性│   ┌──────────────────┐
   │を求めるステップ    │   │ 生成したデータを部品 │ S6
   └──────┬──────┘   │ 特性データとして仮登 │
           │         │ 録をするステップ    │
   ┌──────▼──────┐   └──────────────────┘
   ◇最適な組合せパターンを│
   ◇求めるステップ       │    欠品部品の特性
S12└──────┬──────┘        100
        最適│
S13┌──────▼──────┐
   │組合せ情報を保存する ス│
   │テップ              │
   └──────┬──────┘
           ▼
         終了
```

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┌──────────────────┐
│ 部品特性データの統計 │ S21
│ 処理を行うステップ   │
└─────────┬────────┘
          ▼
┌──────────────────┐
│ 生成データ数を設定す │ S4
│ るステップ          │
└─────────┬────────┘
          ▼
┌──────────────────┐
│ 統計処理データに基づ │ S22
│ く分布を生成するステ │
│ ップ               │
└─────────┬────────┘
          ▼
┌──────────────────┐
│ 生成したデータを部品 │ S6
│ 特性データとして仮登 │
│ 録をするステップ    │
└──────────────────┘
```